CAUSES AND EFFECTS OF DELAY IN OROMIA ROADS CONSTRUCTION PROJECTS PERTINENT TO OROMIA ROADS AUTHORITY ROAD PROJECTS

FIRDISSA YADETA BAYISSA

MASTERS OF BUSINESS ADMINSTRATION

IN CONSTRUCTION MANAGEMENT

ADDIS ABABA SCIENCE AND TECHNOLOGY UNIVERSITY

FEBRUARY 2018

CAUSES AND EFFECTS OF DELAY IN OROMIA ROADS CONSTRUCTION PROJECTS PERTINENT TO OROMIA ROADS AUTHORITY ROAD PROJECTS

BY

FIRDISSA YADETA BAYISSA

A Thesis Submitted to College of Natural and Social Science,

Department of Business and Management

In Partial Fulfillment of the Requirement of the Masters Degree of Business Administration in Construction Management

ADDIS ABABA SCIENCE AND TECHNOLOGY UNIVERSITY

FEBRUARY 2018

DECLARATION

I hereby declare that, this thesis entitled "Cause and Effects of Delay in Oromia Road Construction Projects Pertinent to ORA Road Projects" was composed by myself, with guidance of my advisor, that this work contained herein is my own except where explicitly stated otherwise in the text, and that this work has not been submitted, in whole or part for any other degree or processional qualification.

Name :	Signature	Date
_____	_____	_____

Certificate

This is to certify that the thesis prepared by Mr. Firdissa Yadeta Bayissa entitled **"Cause and Effects of Delay in Oromia Roads Construction Projects Pertinent to ORA Road Projects"** and submitted in fulfillment of the requirement of the Masters Degree of Business Administration in Construction Management complies with the regulations of the university and meets the accepted standards with respect to originality and quality.

Approved by Board of Examiners

Examiner (External)	**Signature**	**Date**
Examiner (Internal)	**Signature**	**Date**
Advisor	**Signature**	**Date**
Chairman	**Signature**	**Date**
College Dean	**Signature**	**Date**

Abstract

Many road construction projects have been undertaken throughout the Oromia Regional State as part of the government's regional development plans. However, it becomes difficult to complete projects in the pre agreed time. One of the critical problems facing these projects was the frequent and lengthy delays that occur.

The main objective of this research was to identify the major causes of delays in Oromia roads construction projects pertinent to ORA road projects along with extent of delays and to know the effects of this delay on the performance of projects. The research was undertaken through an intensive literature review and a survey on selected road projects, to know the opinion of client, contractors and consultants. The survey was carried out through a questionnaire survey together with desk study and some focus group discussion. The questionnaire contained questions on delay causing factors revealed by the literature review (35 factors) categorized into four groups. A total of 39 questionnaires from client, contractors, and consultants were collected and a desk study of 10 completed and ongoing road construction projects were analyzed. The identified causes of delay were calculated with Relative Importance Index (RII).

The desktop study revealed that all ten of road construction projects experienced delay. The extent of the delays ranged from a minimum of 3% to a maximum of 259% of the agreed contract time. The research revealed that the most contributing factors to delays were: delay to deliver the site (right of way problem), financial problems inspections, equipment availability and failure, suspension of work by owner or contractor and weather conditions were the most delay causing factors of roads construction projects in Oromia pertinent to ORA road projects. Time and budget overrun have been found to the most dominant effects caused by delays in road construction projects in the region. Therefore, in order to minimize delay in road construction projects, the client should make ready the site for work, and the contractor should have work plan comprising of financial resources and should avoid suspension of work that lead for additional time.

Acknowledgment

My first and Greatest Glorious thank is for Almighty God in the Name of Jesus that has helped me in the course of my life.

My next heartfelt gratitude goes to my advisor Dr. Zeleke Ewnetu my advisor, for all his guidance, insightful comments, patience, and encouragement throughout the process of the research, without which it would have been difficult to succeed.

I am indebted to all who encouraged me in the process of conducting this research and gave me the courage when I was really in need. It is a pleasant aspect that I have now the opportunity to express my gratitude for them.

I would also like to extend my special thanks to my family and my friends for their moral support and encouragement.

Finally, my special thanks goes to ORA staffs, contractors and consultants working with the authority for their immeasurable support in providing necessary data and documents beside to completing questionnaires.

Table of Contents

CHAPTER ONE: INTRODUCTION

1.1 Background

Construction industry which is the leading sector in domestic market has also become one of the leading sectors in global market. Approximately 8% of the global gross domestic product (GDP) depends on construction industry (MEGARON 2014). This shows the importance of the construction industry in the global economy. Construction has been an aspect of life since the beginning of human existence. Presently, the construction sector is leading and expected to spearhead modernization and industrialization in Ethiopia, besides to improving the livelihood of the people in the sector. Construction industry, being the largest employer in the country, it is also an engine for technology, innovation and overall development (Tekle Hagos, *et al.* 2012).

1.2 The Road Sector in Ethiopia

The establishment of the Imperial Highway Authority, (IHA) in 1951 marked the institutional beginning of state-led road construction in Ethiopia. It was established by an imperial proclamation (No 115/1951) as an autonomous governmental agency under the Ministry of Public Works and Communication. In the following years, the IHA initiated several Highway Programs to improve and extend the Ethiopian road network. From the year of establishment in 1951, the organization managed to undertake various physical and policy activities.

A program development of road that started in 1951 with establishment of IHA had six highway programs (ERA, 2009). These were:-

I. **First highway program (1951-1957):**-The program involved a total capital investment of birr 77 million and largely consisted of the reconstruction and maintenance of 1525 km of badly damaged and 2686km of all weather roads. The road constructed during this time included: Addis-Assab (860km), Addis-Jimma (355km) and Addis-Nekempt (331km). Moreover, road maintenance was carried out on Addis -Adigrat, Addis- Blue Nile and Addis-Shasemene trunk roads.

II. **Second Highway Program (1957-1966):-** The program provided for the continued maintenance and improvement of 4500km of main highways, for the construction of 800km of new roads and improvement of 1000km of other existing roads. The amount disbursed in this program was 110 million birr.

III. **Third Highway Program (1965-1968)**:- The program involved a total outlay of Birr 60 million which went into the construction of 700km of primary and secondary roads, 1000km of feeder roads and 1040km of asphalt surfacing works.

IV. **Fourth Highway Program (1968-1973)**:- During the Fourth Highway Program 820 km of new, primary and secondary roads were constructed. It was during this program that four feasibility studies of future road works and technical assistance and advisory service in the reorganization of the Authority were started. The program also included expert assistance in the area of engineering, operation and maintenance, overseas training with practical orientation for equipment superintendents, foremen and mechanics and others. Out of the total program of the planned 2246km roads 1600km were completed.

V. **Fifth Highway Program (1974-1976)**:- In this program great emphasis was given to the construction of feeder road network to support the agricultural development, strengthening the institutional capability of the Road Agency and providing assistance to the local contracting industry. The program covered the construction of 539km of feeder road and 322 km of asphalt surfacing projects. It also involved the construction of road maintenance projects worth Birr 14 million and further strengthening of the organization and developing the domestic construction industry.

VI. **Sixth Highway Program (1976-1978)**:- During this time the rehabilitation of 284 km of primary roads, 280 km of secondary roads, construction of 809 km new gravel feeder road, 657km of service-to traffic and 1660km of rural roads were executed.

Structurally under the Ministry of Transport and Communication, the newly established independent authority was responsible for the construction, maintenance and rehabilitation of highways as well as of rural roads. Within the ERA, the importance of rural roads was acknowledged by the establishment of the Rural Roads Department (RRD) at the same structural level as the Highway Department (Ayele Tarekegn 1987: ETCA 1986).

Beginning 1970, the program of rural road expansion was commenced with major emphasis to improving accessibility and mobility to agricultural potentials.

In 1951 the total stock of road network was only 6,400 km. It grew to 46,812 kms in 2009. (ERA2009). The rise in the length of road was due to the emphasis given to the sector. In particular, the current government, the Federal Democratic Republic of Ethiopia, has placed increased emphasis on improving the quality and size of the road infrastructure. To address the constraints in the road sector, related to restricted road network coverage and low standards, the Government formulated the Road Sector Development Program (RSDP) in 1997. The RSDP has been implemented in four separate phases, as follows:

- RSDP I – Period from July 1997 to June 2002 (5 year plan)
- RSDP II – Period July 2002 to June 2007 (5 year plan)
- RSDP III – Period July 2007 to June 2010 (3 year plan)
- RSDP IV – Period July 2010 to June 2015 (5 year plan)

Gradually, the responsibility of administering rural roads was devolved to the newly established regions (ILO 2009). Thus, basically equipped by ERA's property and staff, the regions became "...responsible for the construction and management of the rural roads in their respective area..." (ERA 2009: ILO 2009) and basically equipped by ERA's property and staff.

1.3 The Road sector in Oromia Regional State

The responsibility for the administration of classified rural roads in Oromia was initially given to the Rural Road Construction and Maintenance Department, which was set up within the Bureau of Works and Urban Development of the region in 1993/94. In 1996, the Oromia Rural Roads Authority (ORRA) was established by the Regional Government and given "...the mandate to undertake the construction and maintenance of rural roads in the region" (Oromia Today 2009). Prior to the establishment of Regional Government, road density of all weather roads in the region was 23/1000 km2 (ORA RRNDS: 2012). The ORRA was restructured in September 2008 and undertook a major step toward a public enterprise arrangement for road construction in the region. In the process, the ORRA's own force unit for construction was separated and transformed into a state-owned contractor,

the Oromia Roads Construction Enterprise ORCE. The former ORRA was recently renamed Oromia Roads Authority ORA.

With this arrangement, the Oromia National Regional State (ONRS) among its major construction sectors (water, irrigation, etc) has given a special emphasis for the road construction sector.

ORA with its purpose of establishment and responsibilities, has been working significantly on the road network expansion in the region for the last two decades. However, due to many reasons, the authority has not been able to fully meet its intended objectives. There is still huge demand of roads in the region.

According to the Growth and Transformation Plan I of the region, in 2007, the road density of the region which was 36.7/1000 km^2 at the end of 2002 was supposed to reach 162.3/1000km^2 and the density of road which was 0.45 per 1000 people was planned to reach 1.72/1000 people. However, the final evaluation of GTP I in the year 2007 revealed that the achieved road density was 117/1000 km2 and 1.26/1000 people, respectively. This fact indicates that the achievement was 28% and 27% below the targeted plan respectively.

Among the many reasons that hinder the expansion of road network in the region, delay in construction was identified to be the major reason. Completion certificate of road projects or provisional acceptance certificate and letters of time extensions of ORA reveals that among road construction projects that are run by ORA, the time elapsed and number of day delayed so far ranges from a minimum of 3% to the maximum of 259% of the contract time (103-359%).

But most of the time, due to many reasons, in ORA, among many road projects which has been constructed and are under construction, a number of them failed to meet their original contract time. The accomplishment of the past five years GTP I show that execution of most of the road projects resulted in time overruns. These all facts and others to be addressed lead to further investigation and analysis of causes and effects in Oromia roads construction projects pertinent to ORA road projects.

1.4 Statements of the Problem

The importance of roads extend to all aspects of development of rural and urban communities, including demand for access to health, education, market and others (RRNDS Final Main Report, 2012). On the other hand, delay in construction which is prolonged construction period from initial plan was a serious challenge facing the construction industry.

In this regard, some road construction projects in ORA, proposed and budgeted by regional government, didn't get completed within the initial set targets of time and pre-agreed amount of budget. To mention some road construction projects, *Alge Sachi-Mako-Degga (Ilubabor*), with a total delay of 850 days and *Shambu* town internal asphalt (*H/G/Wollega*), with a total delay 1156 days were among the projects experienced delays.

This elapsed time which result in delay of construction completion in some road projects are the main problems that result in failures to meet the region's development demands in general and the road infrastructure in particular. Unfulfilled demand can lead to dissatisfaction of the end users. While the existence of frequent delays and cost overruns in road construction projects in the region was recognized, no systematic research has been undertaken to document and systematically analyze the problem. Hence, this study was initiated to generate scientific information that may help policy makers to make informed decisions towards improving the performance of the road construction sector in the region.

1.5 Objective of the Study

The general objective of this study was to identify the causes and effects in Oromia roads construction projects pertinent to ORA road projects, regulated by Oromia Roads Authority, and constructed by state owned enterprises and private contractors.

The specific objectives of this study are:

1. To assess the extent of delays in both completed and ongoing road construction projects administered by ORA.
2. To identify the causes of delay in the road construction projects.
3. To analyze the immediate effects of delay in road construction projects.

This research thus attempts to answer the following questions:

1. What are the extents of time delay in Oromia roads construction projects pertinent to Oromia Roads Authority Road projects?
2. What are the important causes of delay in road construction projects of in ORA?
3. What are the effects in Oromia roads construction projects pertinent to ORA road projects?

1.6 Significance of the Study

A study on project delays will lead to a better understanding of the root causes of inefficiency in road construction projects. Once the most significant delay causing factors are identified, the stakeholders of the projects shall then be able to channel their energies and deploy resources to remove the specific limiting factors and thereby reduce delays to the projects. Therefore, the outcome of this study was expected first to present the extent of delay problems of road construction projects in the region, and second to enable the concerned authorities to make informed interventions for improved implementation of road projects in the region. This study on road construction was important in ONRS context because roads are the blood vessels which contribute to economic growth and poverty reduction.

1.7 Scope of the Study

The study particularly focused on the roads that are constructed and completed by ORA in the past GTP I (2003-2007) and, those roads which are currently ongoing by regional capital budget. Even though there are different problems in the execution of construction projects, this research was limited to the main cause and effects of delay in fulfilling the targeted road sector plan.

1.8 Limitations of the Study

As Oromia National Regional State covers large areas, different road sector program are running in the region. Among them, URRAP and ERA's plan of roads development program (both financed by Federal government, but undergone in ONRS) are common.

Because of the limited time and budget allotted for the research, lack of research studies and in accessibility of to get all relevant information from respective offices, the researcher was limited to deal only on the road projects that are managed by ORA and financed by the regional government.

1.9 Structure of the Thesis

The thesis is organized in to five chapters.

Chapter One- Introduction: This presents a general overview of the thesis comprising of the research background, the research objectives, setting out the problems and the manner in which these are addressed. It provides insight into the nature of the topic and issues relating to construction projects.

The second chapter comprises the Literature Review section of the Thesis. The chapter provides an in depth theoretical and empirical study of the causes of construction projects delay along with the type of delay, along with its effect.

The third chapter presents the Research Methodology. It explains the methodology adopted in carrying out the research, the reasons for adopting it and how it facilitated the achievement of the research objectives. It also sets out the survey procedure, selection of survey sample, procedures used in analyzing data collected and its justification.

The fourth chapter presents the analysis and interpretation on the causes of roads construction projects delay, along with its effect. The fifth chapter presents the conclusions and relevant recommendations of the study. The conclusions derived from the research and recommendations for promoting good practice are presented in this chapter. Also included are suggested recommendations for further research.

CHAPTER TWO: LITRETURE REVIEW

2.1 Review of theoretical literature

2.1.1 Introduction

Construction time often serves as a benchmark for assessing the performance of a project and the efficiency of the project organization. Timely completion was one indicator for successful project. Often, the time required to complete construction of projects is more than specified time in Contract. That was why in construction projects, delay could be characterized as the time overwhelm either past consumption date determined in an agreement or past the date that the gatherings settled upon for conveyance of a projects. It is an undertaking slipping over its arranged timetable and was considered as basic issue in construction projects.

They quite often result in additional expense and time. Construction project delays also result in conflicts and mistrust among concerned parties (designer, contractor worker, and consultant). (Khattri *et al.* 2016).

2.1.2 Definition of delay

In construction, the word "delay'' refers to something happening at a later time than planned, expected, specified in a contract or beyond the date that the parties agreed upon for the delivery of a project (Pickavance, 2005). Lo, Fung and Tung (2006) define delay as the slowing down of work without stopping construction entirely and that can lead to time overrun either beyond the contract date or beyond the date that the parties have agreed upon for the delivery of the project.

It is also a project slipping over its planned schedule and was considered as common problem in construction projects. To the owner, delay means loss of revenue through lack of production facilities and rentable space or a dependence on present facilities. In some cases, to the contractor, delay means higher overhead costs because of longer work period, higher material costs through inflation, and due to labor cost increases.

Completing projects on time is an indicator of efficiency, but the construction process is subject to many variables and unpredictable factors, which result from many sources. These sources include the performance of parties, resources availability, environmental conditions, involvement of other parties,

and contractual relations. It rarely happens that a project is completed within the specified time. The construction industry is large, volatile, and requires tremendous capital outlays.

Even with today's advanced technology, and management understanding of project management techniques, construction projects continue to suffer delays and project completion dates still get pushed back. Stumpf(2000).

2.1.3 Types of delay

According to the classification of Syed, *et al.* (2002) delays can be non-excusable delays, excusable non-compensable delays, excusable compensable delays and concurrent delays.

- **Non-excusable delays**

Non-excusable delays are caused by lack of performance of the contractor on the construction project such as a contractor failure to provide an adequate material to complete their job. These delays can be caused by underestimates of productivity, improper project planning and scheduling, poor site management and supervision, wrong construction methods, equipment breakdowns, unreliable subcontractors or suppliers. Therefore, it is contractor's responsibilities to continue their work with no entitlement to claim for extension of time or delay damages until they completed the project.

- **Excusable delays**

Excusable delay is a delay that is caused due to an unforeseeable event beyond the contractor's or the subcontractor's control. Usually, based on common general provisions in public agency specifications, delay resulting from the following events would be considered excusable such as fires, floods, owner-directed changes, errors and omissions in the contract drawing, unusually severe weather and etc. Excusable delays can be further classified into excusable with compensation and excusable without compensation.

- **Excusable delays with compensation**

Compensation delays are caused by the owner or the owner's agents. An example of this would be the drawings late release from the owner's architect. An excusable, compensable delay normally leads to a schedule extension and exposes the owner to financial damages claimed by the contractor. In this

scenario, the contractor incurs additional indirect costs for both extended field office and home office overhead and unabsorbed home office overhead.

- **Excusable delays without compensation**

Non-compensable delay is a delay that is caused by third parties or incidents beyond the control of both the owner and the contractor. Examples typically include: unusual weather, strikes ((Trauner et al., 2009), fires, and acts of government in its sovereign capacity, etc. In this case, the contractor is normally entitled to claim extension of time but no compensation for delay damages. According to Ethiopian civil law/code Article 1973, Strikes that are foreseeable at the time of signing the contract are not considered excusable causes of delay.

- **Concurrent Delay**

Concurrent delay is a problem that happens on most of the construction industry project. In this situation, both owner and contractor are responsible for the delay Rubin et al. (1983). Commonly concurrent delays which involve any two or more excusable delays result in extension of time. When excusable delays with compensation and non-excusable delays are concurrent, an extension of time can be issued or the delay can be distributed between the owner and the contractor. Concurrent delay can be categorized in three types of delays:

If excusable and non-excusable delays occur concurrently, the contractor can only claim for extension of time:

If excusable with compensation and excusable without compensation delays occur concurrently, the contractor is entitled to claim extension of time but no delay damages:

If two excusable with compensation delays occur concurrently, the contractor is entitled to claim extension of time and delay damages.

2.1.4 Causes of construction projects delay

General

There are many factors that contribute to causes of delays in construction projects. These range from factors inherent in the technology and its management, to those resulting from the physical, social, and financial environment. According to Jomah, (2008) time overruns can be divided into three categories:

1. Those over which neither party to the contract has any control:
2. Those over which the owner (or his/her representative) has control:
3. Those over which the contractor (or any subcontractor) has control.

There are a lot of time overrun factors over which consultants have control. But those factors include in owners control. Design changes, poor labor productivity, inadequate planning and resource shortages are the predominant factors influencing time overruns.

Ahmed *et al.* (2003) studied two kinds of cause for delay in construction projects:

1. External causes and
2. Internal causes.

Internal causes of delay include causes arising from three parties involved in the project. These parties include the owner, contractors, and consultants. Other delays, which do not arise from these three parties, are based on external causes for example those that concern governments, materials suppliers, or weather conditions.

Ahmed *et al.* (2003) and (Theodore, 2009) identified the following factors causing delays in construction projects. They have categorized the factors that cause delays in the four categories;

1) Contractor's responsibility

The factors that are related to contractor's responsibility are:

- poor qualification of the contractor's technical staff
- shortage of materials on site
- construction mistakes and defective work
- poor skills and experience of labor
- shortage of site labor
- low productivity of labor
- financial problems
- coordination problems with others
- conflicts in sub-contractors schedule in execution of project

- lack of site contractor’s staff
- poor site management and
- delays in site mobilization

2) Consultant’s responsibility

The factors that are related to consultant's responsibility are:

- absence of consultant’s site staff
- lack of experience on the part of the consultant:
- inadequate experience of consultant:
- delay in approving major changes in the scope of work:
- mistakes and discrepancies in design documents

3) Owner’s responsibility

The factors that are related to owner's responsibility are:

- delay to deliver the site
- lack of working knowledge
- slowness in making decisions
- lack of coordination with contractors
- change orders by owner during construction(replacement and addition of new work to the project and change in specifications)
- financial problems (delayed payments, financial difficulties, and economic problems)
- slowness in decision making process and
- poor communication and coordination

4) External factors:

The factors that are related to external factors are:

- delay in obtaining permits from municipality
- lack of materials on the market
- lack of equipment and tools on the market
- poor weather conditions, poor site conditions (location, ground, etc.)
- poor economic conditions (currency, inflation rate, etc.)
- changes in laws and regulations, transportation delays
- external work due to public agencies (utilities and public services) and
- delay in providing services from utilities (such as water, electricity) (Alghbari *et al.* 2007)

In addition, Chan et al. (2002), Alwi et al. (2002), Assaf (2006), Odeh and Battaineh (2002) and Alghbari et al. (2007) classified factors that cause time overrun into eight groups; owner, contractor, consultant, material, labor and equipment, contract(inadequate contractor experience), contractual relationships and external factors.

2.2 Review of empirical literature on construction projects delay

Delays in construction projects are very common in most parts of the world even with the introduction of modern management techniques. Studies conducted on the causes of construction project delays in different countries of the world have been examined.

A study carried out an investigation into factors causing construction project delays in Msafiri Atibu Seboru (2015) by Talukhaba (1999) in Kenya, and Assaf, *et al.* (1995) studied the causes of delay in large building construction projects in Saudi Arabia found out that the major causes of delay were: client's payment, architect's instructions, client's instructions, unexpected physical features (rock terrain, underground water, conflicts in work schedules of subcontractors, and slow decision making and executive bureaucracy in the owners' organizations. Al-Tabtabai (2002) shared the same added limited authority among supervision staff. Msafiri Atibu Seboru (2015) stated that El-Razek, *et al.* (2008) conducted a study on causes of delay in building construction projects in Egypt and found non-utilization of professional construction/contractual management as additional causes of delay in addition to Talukhaba (1999), Assaf, *et al.* (1995), Al-Tabtabai (2002).

Mansfield, *et al.* (1994) studied the causes of delay and cost overruns in construction projects in Nigeria and the results showed that the most important factors were: financing and payment for completed works, poor contract management (lack of experiences on contractor administration), materials shortages, and improper planning.

Memon, *et al.* (2012) conducted a study on time and cost performance in construction projects in Malaysia and Owolabi *et al.* (2014) in Nigeria revealed that the most important delay factors were: design and documentation issues, financial resource management, project management and contract administration, contractors' site management, and lack of information and communication technology and slow decision making

In Ghana, Frimpong *et al.* (2003) carried out a research on causes of delay and cost overruns in construction of groundwater projects in developing countries. According to the researchers indicated 75% of the projects in Ghana exceeded the original project schedule. The study revealed that the most

important causes of delay were: monthly payment difficulties, poor contract management, material procurement, inflation, and contractor's financial difficulties.

In Morocco, Challal and Tkiouat (2012) researched on the causes of deadline slippage in construction projects and found out five major causes of delay were: errors in initial budget assessment, multiple modifications in architectural and engineering designs, site hazards, and insufficiency or lack of prior study.

Alinaitwe, *et al*. (2013) studied in Uganda's public sector construction projects on causes of delays and cost overruns and Kamanga *et al.* (2013) in Malawi in road construction projects carried out and showed that the major causes as: change of work scope and/or changes in material specifications, high inflation, insurance and interest rates, shortage of foreign currency (importation of materials and equipment), poor monitoring and control, incompetency and/or unreliability of supervisors, delayed payment to contractors-subcontractors and/or suppliers, insufficient equipment and fuel shortages.

Memon (2014) conducted a study on contractor perspective on time overrun factors in Malaysian construction projects and the major factors causing delays were: frequent design changes, change in the scope of the project, financial difficulties of owner, delays in decisions making, and unforeseen ground conditions.

In India, Desai and Bhatt (2013) studied the critical causes of delay in residential construction projects and found out that the most important delay factors were: original contract duration was too short, legal disputes between various parties, ineffective delay penalties, delay in progress payments by owner, and delay to deliver the site to the contractor by the owner.

Sweis, *et al*. (2008) studied delays in construction projects in Jordan and the major causes of delay were: financial difficulties faced by the contractor, too many change orders from owner, poor planning and scheduling of the project by the contractor, presence of unskilled labour, and shortage of technical professionals in the contractor's organization.

In India, Ravisankar, et al. (2014) conducted a study on the quantification of delay factors in the construction industry.

The researchers indicated that time overrun vary between 50% and 80% for projects completed worldwide. The study revealed that the most important causes of delay were: Shortage of unskilled and skilled labor, design changes by owner or his agent during construction, fluctuation of prices, high waiting time for availability of work teams, and rework due to errors. Shanmugapriya et al. (2013)

investigated significant factors influencing time and cost overruns in Indian construction projects. The researchers indicated that 60% of projects in India suffered time overruns.

The study found out that the following were the most significant factors causing time overruns: Material market rate, contract modification, rework of bad quality performance, unclear specification.

Kholif, *et al*. (2013) analyzed time and cost overruns in educational building projects in Egypt and found out that the major causes of time overruns were: political insecurity (instability), financial difficulties of contractor, escalation of material prices (inflation), high cost of skilled labor, and difficulties in getting work permits from government. Kagiri and Wainaina (2008) studied time and cost overruns in power projects in Kenya and revealed that the major causes of time overruns were: delayed payment to contractor, employer cash flow problems, delays in disbursement of funds by financiers, bureaucracy of government agencies, and delay of access to site.

In Sri Lanka, Dolage *et al*. (2013) carried out a study causes of time overrun in construction phase of building projects and found out that the following were the major causes of time overrun: delay in progress payment by clients, inaccurate planning and scheduling of projects by contractors, rainy weather, non availability of experienced technical staff of contractor, and excessive work in hand of the contractors.

Sweis (2013) investigated factors affecting time overruns in public construction projects in Jordan and Hoai et al. (2008) in Vietnam researched on delay and cost overruns in large construction projects revealed that the major causes of delay were: too many change orders from owner, poor planning and scheduling of the project by the contractor, ambiguities and mistakes in specifications and drawings, slow decision making from owner, and Poor qualification of consultants, engineers, staff assigned to the project, poor site management and supervision, poor project management assistance, financial difficulties of owner and financial difficulties of contractor.

In South Africa, Baloyi *et al*. (2011) researched on causes of construction cost and time overruns and revealed that the following were the most important causes of time overruns: Incomplete` drawings, design changes, clients' slow decision-making, late issue of instructions, and shortage of skilled labor.

Alaghbari, *et al.* (2007) studied the significant factors causing delay of building construction projects in Malaysia and found out that the major causes of delay were: owners' financial difficulties and economic problems, contractors' financial problems, late supervision and slowness in making decisions, consultants' slowness in giving instructions, and lack of materials on market.

Mohammed and Isah (2012) carried out a study on the causes of delay in Nigerian construction industry and the results showed that the major causes of delay were: improper planning, lack of effective communication, design errors, shortage of supply like steel, concrete, and slow decision-making.

Fugar *et al.* (2010) researched on delays in building construction projects in Ghana and found out that the most important causes of delay were: delay in honoring payment certificates, underestimation of cost of projects, underestimation of complexity of projects, difficulty in accessing bank credit, and poor supervision.

Kikwasi (2012) studied the causes and effects of delays and disruptions in construction projects in Tanzania and the results showed that the following were the major causes of delay: design changes, delays in payment to contractors, information delays, funding problems, and poor project management.

Ibironke *et al.* (2013) analyzed the non-excusable delay factors influencing contractors' performance in Nigeria and revealed that the major delay factors were: insufficient amount of equipment, inaccurate time estimates, monthly payment difficulties, change orders, and inaccurate cost estimates.

Wong *et al.* (2012) studied the factors affecting construction time in Australia and the results showed that the following were the major factors affecting construction time: skills shortage, financial difficulties, shortage of labor, unrealistic deadlines for project completion, and unforeseen ground conditions.

Faridi *et al* (2006) studied the significant factors causing delay in the construction industry in the United Arab Emirates and revealed that the following were the most important factors causing delay: preparation and approval of drawings, inadequate early planning of the project, slowness of the owner's decision-making process, shortage of manpower, and poor supervision and poor site management.

In Malaysia, Abdulla *et al.* (2010) studied the causes of delay in construction projects and the results showed that the major causes of delay were: cash flow and financial difficulties faced by contractors, contractor's poor site management, ineffective planning and scheduling by contractors, inadequate contractor experience, and shortage of site workers.

Sambasivan *et al.* (2007) researched on the causes and effects of delays in Malaysian construction industry and the results showed the following major causes of delay: improper planning, site management, inadequate contractor experience, finance and payments of completed work, and subcontractors.

Patil, et al. (2013) researched on the causes of delay in Indian transportation infrastructure projects and the results showed that the following were the most important causes of delay: delay due to land acquisition, environmental issues related with project, financial closure, change orders by the client, and Poor site management and supervision by contractor.

Ayudhya (2011), Mahamid (2013), Andi et al. (2010) evaluated the common delay causes of construction projects which focus on external factor, such as adverse weather conditions, (segmentation of the west bank and limited movement between areas and political situation in Palestine in particular), progress payments delay by owner in addition to financial problem, design changes during construction and lack of efficient equipment.

Akogbe, *et al.* (2013) studied delay factors for development construction projects in Benin and found out that the major causes of delay were: contractor's financial capability, owner's financial difficulties, poor subcontractor performance, materials procurement, and changes in drawings. Mustapha (2013) researched on the factors of delays in project delivery in Ghana and found out that the major delay factors were: delay in honoring payment certificates, delay by sub-contractors, fluctuation of prices, difficulty in accessing bank credit, and client initiated variations.

Asiamah and Asiamah (2013) conducted a study on causes of delays in construction of public buildings in Ghana and revealed that the following were the most important causes of delay: method of construction, long bureaucratic process of honoring certificates, variation orders, cash flow problems, and lackadaisical attitude to decision making.

According to Kivaa (2000), one cause of poor time performance in construction projects in Kenya is the inadequacy of initial contract periods due to erroneously calculations that disregarded all the necessary factors that influence the construction time of a project.

2.3 Effects of construction project delay

When construction projects are delayed, the effects often have negative consequences to the stakeholders. A research conducted by Aibinu and Jagboro (2002) showed the effects of the delay in the construction industry of Nigeria. They discovered six possible common effects which arising in most countries as a result of delay. These effects were:

- cost overrun
- time overrun
- disputes

- arbitration and litigation and
- total abandonment of project

2.4 Implication of Delay and its effect

Delays have an implication and effect to the construction project performance and to the client or project owner. Delay certainty is known to be the top priorities of construction clients (Davenport, 1997). Although affected by many internal and external factors, construction time. However, low cost and speedy project are not always the main concern of clients today; instead time and cost certainty are becoming increasingly important (Flanagan et al., 1998) and it is one of the most important contractor performance criteria for clients' satisfaction (Soetanto et al.,2001 and Construction Industry Board, 1996).

Client satisfaction is an important determinant of contractor performance evaluation and comparison (Sidwel, 1988) and it is the driving force for continuous improvement of contractor performance (Ahmed and Kangari, 1995). Companies differentiate themselves from competitors and maintain a competitive edge by providing and keeping clients satisfied (Torbica and Stroh, 2001).

Client's long term interest to the performance of contractor is in the work performed. It must conform to the specifications established for the project. Delay (time overrun) and cost overrun are costly and often result in disputes and claims, impair the feasibility for project owners, and retard the development of the construction industry (Odeh, A. M and Battaineh, H. T, 2002).

2.5 Minimization of construction delay

According to Divya, Ramya (2015), when a construction delay occurs, there is no question that the owner suffers financially. However, the extent to which an owner can recover its loss of income from the contractor, and more importantly minimize the risk that such delays will occur, depends largely on how the construction contract was drawn up. Based on several studies of project success factors and rectification of delays in construction project, a total of 15 methods have been identified.

Assaf, *et al.* (2006**)** identified the following points in order to minimize and control delays in construction projects. According to him, owners should give special attention to the following factors: Pay progress payment to the contractor on time because it impairs the contractor's ability to finance the work, minimize change orders during construction to avoid delays, avoid delay in reviewing and

approving of design documents than they anticipated, check for resources and capabilities, before awarding the contract to the lowest bidder.

Contractors should also consider the following factors: enough number of labors should be assigned and be motivated to improve productivity, contractor should manage his financial resources and plan cash flow by utilizing progress payment, administrative and technical staff should be assigned as soon as project is awarded to make arrangements to achieve completion within specified time with the required quality, and estimated cost.

Assaf, *et al.* (2006**)** added also, consultants should look to the following points: reviewing and approving design documents, consultants should be flexible in evaluating contractor's works.

The construction team should practice the identified measures of reducing construction project delays such as: Site management and supervision, effective strategic planning, clear information and communication channels, use proper and modern construction equipment, and proper project planning and scheduling among other identified measures.

Assaf, *et al.* (2006**)** finally, recommended that architects/design engineers should focus on the following points: producing design documents on time, mistakes and discrepancies in design documents have to be taken care off.

2.6 Experiences of delay in Ethiopian road construction projects

A number of delay examples can be mentioned at national and international level. For instance, most of the construction projects in Ethiopia have had problems with time and cost overruns and that had caused a lot of concern (Becker and Behailu, 2006). Time and cost overruns in road construction projects in Ethiopia in particular and in Oromia Regional State in particular is one of the most significant problems in the field construction management.

Utilizing questionnaire survey of 70 completed public building constructions projects, Fetene (2008), examined factors that cause cost overrun during construction and their effects on public building construction projects in Ethiopia. The author also identified, and assessed the impact of cost overrun on the delivery of construction projects.

Getachew Tsegaye (2009) in his study of the design risk management in Ethiopian federal road projects, pointed out that the major factors influencing time and cost overrun were errors in estimation of quantities, inadequate subsurface investigation and interpretation, poor pavement investigation and interpretation, inadequate/inaccurate topographic survey data, lack of design details, omission of

works, change of alignment, poor specification, late implementation of design and poor drainage assessment.

ERA (2005) indicated that design consultants lack own quality assurance system: they do not strive to create a methodology for the local conditions, instead, copy or adopt what has been previously developed. In some cases they do not have sufficient knowledge on the type of services ERA needs, and do not feel accountable for the services they render. Moreover, most of the consultants are new to the job and willing to take up contract at a significantly low bid price and consequently ending up producing low quality work. The study further revealed that Terms of Reference issued by ERA was not precise and clear. These problems reflect the existence of design risks which need to be addressed.

2.7 Experiences of delay in Oromia Road Construction Projects

Many government construction projects have been undertaken throughout the regional state of Oromia, as part of the government's regional development plans in the past two decades, with significant public expenditure involved.

One of the critical problems concerning these projects was the frequent and lengthy delays that occur. This factor may emanate from different stakeholders of the construction project, imposing numerous effects on end users and overall development plan of the regional state.

Even if efforts were made by regional government to improve institutional capacity of road sector, still large part of the region have no access to road transport resulting in difficult to social services and markets for agriculture out puts and goods in puts. Besides other facts, to improve the regional roads network, the roads construction project should be completed on time. But the nature of Road construction project makes them unique in that they are site specific and custom built. No standardized approach can built utilized in all cases. Each project is designed and executed in a specific location and under specific circumstance. This makes it difficult to tell ahead of time exactly how a project will turn out. In most cases therefore it is hard to tell exactly a head of time what the final cost and duration of a project will be.

The inability to complete projects on time and within budget continuous to be chronic problem in region and is worsening; even though the magnitude of these delays varies considerably from project to project. The problem may arise from Pre-construction events causing delays during construction stage and Construction stage events causing delay. Because of delay, the owner and/or the user loses economic, political & social tangible benefits during extended time and the contractor face to the cost overrun and opportunity cost. But both by the regional government and the regional road authority,

delays of the projects and their impacts are not given attention and hence are affecting the whole parties in the sector, including the construction industry itself.

According to the data obtained from the reviewed document, and analysis of contract documents against performances of road projects, issued time extension letters, completion certificate of road projects, and provisional acceptance certificate of ORA reveal experience and existence of delay in construction completion of road projects. The work progress of most of the projects under constructions by the government enterprises and some of the projects under the construction of the private contractors was lag behind the schedule and granted additional time. These are due to the cumulative effect of pre-construction and construction stage problems. The major causes of delay of the projects under construction by the government enterprise are: design defects, change order, poor planning, right of way problem, (the authority has no legal ground to pay composition arises due to right of way problem), and the scarcity of budget allotted by the owner. But the major causes of delay of the roads construction projects focus mainly on design defects, change order, poor planning, lack of contract administration knowledge and in efficient in equipment allocation and bid evaluation criteria.

To mention some road projects and the extents of the delay, *Alge Sachi-Mako-Degga* (*Ilubabor*), with total number of days delayed 850 and *Shambu* town internal asphalt, (*H/G/Wollega*) with a total delay 1156 days are among the projects experienced delay.

Getachew Ligdi (2015) in his case study on Jimma town internal asphalt stated that the information obtained from detail investigation of the project document of the client and consultant, oral communication (interviews) with client and consultant engineers, oral communication with contractors advocator, bid document and written data (from prepared questioners) from the client and consultant representative, the project's initial cost was Birr 130,345,304.71 including the supplementary amount and it was expected to be complete in 433 days. Even though due to several reasons the contract of the project was delayed (extended) too long days the construction of the project was not completed and the project construction was out sourced to the new contractor ERCC with the amount 120,878.000 Eth Birr after the breach of the contractual agreement with the original contractor. Even though the contractor submitted over five issues that were directly related to time extension the client accepted only three of them which is related with design defects, weather conditions and ROW problems. Out of this time extension claims the contractor was granted 377 days. This amount is 87% of the original contract period.

2.8 Summary of review of literature on the causes and effects of construction delay

There is a wide range of views for the causes of time delay for construction projects. Some are attributable to a single party, others can be ascribed to several quarters and many relate more to systemic faults or deficiencies rather than to group or groups.

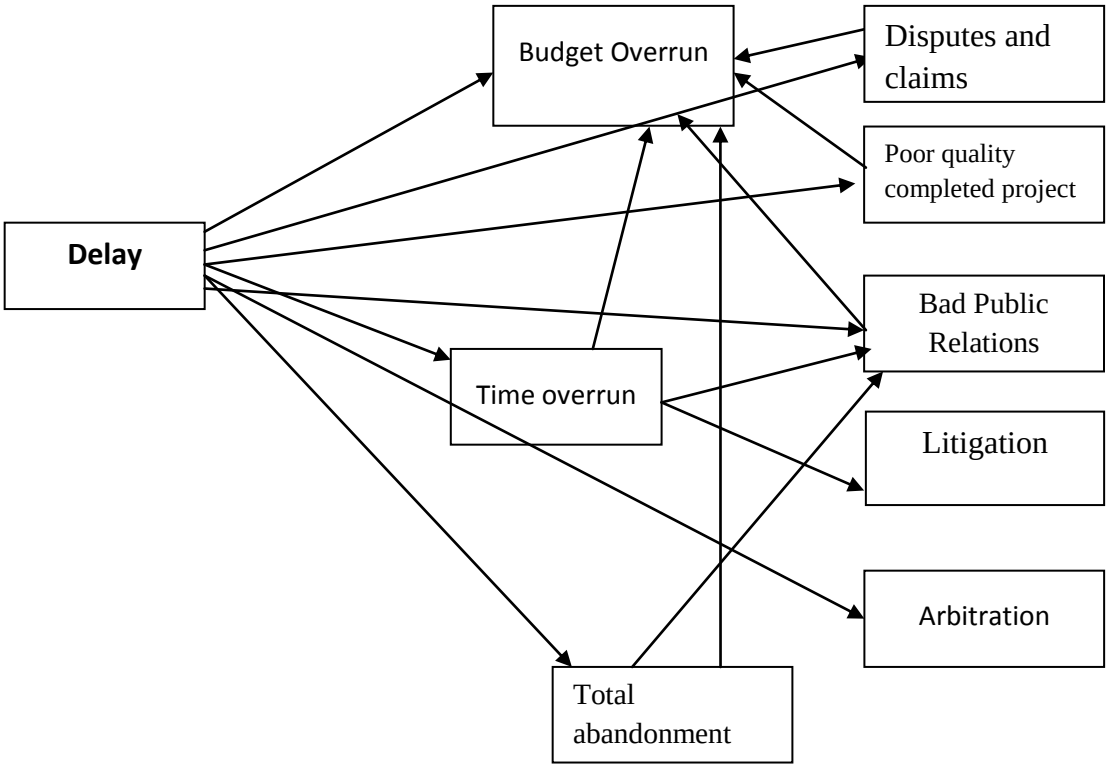
The literature reviewed reveal that time overrun may be caused by any party to the contract and may be a direct result of one or more circumstances. Among the many causes listed in the review, project related factors, owner/client related factors, consultants related factors, contractor related factors and externalities related factors are the major ones. Each category of causes of delays had different factors that can lead to delays on construction projects. Hence, this study examined causes of road construction project delays from four different categories as compiled from an extensive literature review.

In the cases of Ethiopia, contractual documents of road projects in the authority and correspondence letters, particularly permits to time extension in ORA reveal that delays occur in almost all construction projects and the magnitude of these delays varies considerably from project to project. Some projects are only a few days behind the schedule while others are delayed over a year, which may resulted from the reviewed causes of delay.

Hence it is essential to define the actual causes of delay in order to minimize and mitigate and if possibly, to avoid the delays in road construction project.

A contract time overrun also have adverse effects on both the owner and contractor (either in the form of lost revenues or extra expenses) and it often raises contentious issue of delay responsibility, which may result in conflicts that frequently reach the courts. Among the effects which arise in most countries as a result of road construction project delay are: cost overrun, time overrun, disputes, arbitration and litigation and total abandonment of project.

Figure 2.1 Diagrammatic representations of effects of project delay


Budget Overrun
Disputes and claims
Poor quality completed project
Delay
Bad Public Relations
Time overrun
Litigation
Arbitration
Total abandonment

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This third chapter of the thesis deals with the methodology, comprising the research strategy, research design and data collection. The methodology used is aimed at collecting and analyzing appropriate data that will enable identify the causes and factors of delay of roads construction projects in Oromia pertinent to ORA road projects.

3.2 Research type and strategy

This research can be categorized as applied, exploratory, descriptive and co-relational type. It is applied and exploratory because the research finds whether time and cost overrun exists or not. It is also descriptive because it tried to describe the extent delay of roads construction projects in Oromia pertinent to ORA roads projects. Concerning the research strategy, two types of strategies are generally used in studies: quantitative and qualitative research. Quantitative approach is used to gather factual data and to study relationships between facts and how such facts and relationships accord with theories and the findings of any research executed previously. Qualitative approach seeks to gain insights and to understand people's perception of "the world" as individuals or groups (Fellows and Liu, 1997).

The research strategy used in this research was quantitative research. Quantitative research was chosen to know stakeholder’s opinion towards delay causing factors and rank in roads construction projects in Oromia pertinent to ORA roads projects. In addition, some qualitative data were also incorporated for an in depth explanation of the main causes and the consequences of delay.

3.3 Research design

"Research design" refers to the plan or organization of scientific investigation, designing of a research study involves the development of a plan or strategy that will guide the collection and analyses of data (Poilt and Hungler, 1985). Accordingly, this research consists of the following parts categories of five parts. The first part consists of the proposal for identifying and defining the problems and establishment of the objectives of the study. The second part of the research includes literature review, in which delay in construction were reviewed.

The third part of the research included a methodology of the thesis. The fourth part of the research includes result and discussion. In this phase the result of desk study and questionnaires were discussed. The last part of the research includes the conclusions and recommendations forwarded.

3.4 Target population

The sampling frame is the list of population from which the samples were drawn from. The focus population consisted of rural roads and town internal asphalt which are completed and ongoing by different bodies. The respective contractors, supervision and consultancy firms were (State owned road construction enterprise and private contractors and also state owned design and construction supervision enterprise and private consultants). Concerning respondents involved in this research were ORA officials and senior experts, ORCE, OWWCE, private contractors and consulting firm's representing road projects under study were respondents of this research.

3.5 Sampling Techniques

The projects under investigation were completed road projects and currently under construction by ORA and financed by the regional capital budget which include 45 rural roads and 8 internal town asphalt constructions (ORA 2009). These projects are run by 15 contractors and 7 consultants (two contractors and one consultant is state owned and the rest 13 contractors, and 6 consultants are private companies). Among 45 rural roads, 14 were excluded due to contract modification and other 2 are bridge constructions. Therefore, in order to minimize biases that might occur, the researcher obliged to be undertaken considering purposive sampling, which may best represent roads in the region. In this regard, some literatures also reinforce the reason and advantages of purposive sampling, in such a way that "purposive sampling is a useful sampling method which allows a researcher to get information from a sample of the population that one thinks knows most about the subject matter," Walliman (2005).

3.6 Population and sample size

The focus population consisted of rural roads and town internal asphalt which are completed and ongoing by different bodies, with respective supervision and consultancy firms. ORA 2009 and contract documents helped the researcher to determine the number of sample sizes of roads to be 23 (18 rural roads out of 29 and 5 internal town asphalt road out of 8) and 45 respondents to questionnaire were distributed to these respondents of the representatives of road projects along with consultants and

client. A focus group of staffs of the financing body, BoFED and ORA's senior staff were participated to gather additional information on the research topic. Table 3.1 summarizes the number and types of road projects, Contractors and Consultants currently operating in the region, Regional Capital Projects. Based on the list given in the table 3.1, Table 3.2 also demonstrates sampled numbers of respondents from respective contractors and consultants and client.

Table: 3.1 Numbers and types of road projects in the population along with contractors and consultants.

No	Type of Road Projects and contractors/consultants	No of Projects	Projects run by				Projects being supervised by		
			State Owned enterprise	State Owned enterprise and sampled	Private contractors	Private contractors and sampled	State Owned Consultant	Private Consultants	Private Consultants
1	Rural Road	45	16	**11**	13	**7**	9	16	4
2	Towns Int. Asphalt	8			8	**5**	-	6	2
3	No of Contractor	-		-					
4	No of Consultants		-	-			2	7	-
Total		**53**	**16**	**11**	**21**	**12**			

Source: *ORA Annual Plan and Contract document*

The table shows that the current roads projects in Oromia pertinent ORA, which are under the administered and managed by the Road Authority. There are 53 total projects. Among these, projects of 45 rural roads and 8 internal town Asphalt Constructions, two are bridge construction and 14 rural roads have contract modification and ignored from being a population. Therefore, the research focused on only 23 rural roads and 8 town internal asphalts, considering its population)

Table: 3. 2 Sampled numbers of respondents from respective contractors and consultants and client.

Population	Contractor		Consultant		Client	Total
Category of	State Owned	Private	State Owned	Private		
Number of respondents	11	12	5	7	10	45
% composition	51		27		22	100

As shown in the table, based on sampled road projects, 51% of the respondent were from contractor side, 27% from the consultant side and the rest 22% from client side. The rate of responses in respective of each respondent will be discussed in the chapter four.

3.7 Data collection techniques

Among the available methods in collecting data three methods were adopted, these are literature review, interview and questionnaires. Literature was reviewed to establish what others have documented on the subject matter. Useful information has been collected from different source. A questionnaire designed in accordance with the objectives based on comprehensive literature review has been used as data collection tool in this study.

In order to investigate presence of road construction delay in ORA, a desk study of completed and ongoing road projects were made. Accordingly, 10 road projects were identified and their agreed contract period and date of completion, actual completion date and time of delayed were recorded.

Primary data consists of information obtained from questionnaires and the responses conducted with targeted population, intended to design a simple, clear questionnaire with limited open ended questions and using a series of check boxes. The media of data collection in questionnaire was English and questionnaires were distributed door to door. The study aimed to obtain facts and to know opinion of the client, consultant and contractor (of Grade 1) representatives on ranking the range of causes and effects of delay. In this regard, specific projected treatment of each problem the data required was stated and how the data was secured, the respondents did not have to disclose their identity when responding to the questionnaire. All the responses were treated as strictly confidential.

In addition, interview and a focus group discussion have been conducted in *Afan Oromo* language particularly with contract administration team, planning department and financing body.

The questionnaire was tested by the researcher for precision of expression, question duplication, objectivity, suitability to problem situation and probability of favorable reception and return. Walliman (2001) recommends that questions should be pre tested on a small population or pilot study. In accordance with the above recommendation, a draft questionnaire was sent to five supervisors of ORA, two consultants and one contractor to obtain their comments regarding any items that they had

difficulty in understanding and to determine the time it takes to complete the document. The pilot test showed that the questionnaire can easily be understood and not time taking.

3.8 Questionnaire design and approach

The questionnaire included three sections. The first section contained general questions about the experience, types of projects implemented by the respondents, amount of delay they experienced in their previous and currently ongoing projects. Section two of the questionnaire concentrated on causes of delay in roads construction projects. Participants in the survey have the factors that cause delay were identified to be 35 which were observed to be significant at different level in ORA (from "extremely significant" to "not significant") within the questionnaire and asked to point out their answer to the level of significance of the delay factors.

These were categorized in to four groups of factors: Group 1: included 3 factors related to project. Group 2: included 7 factors related to owner/client. Group 3: included 11 factors related to Contractor. Group 4: included 7 factors related to externalities. The third section of the questionnaire concentrated on the effects of delay on roads construction projects in ORA. Different reviewed literatures, reveals that six effects of delay are characterized, and other suggests seven effects. Accordingly, in this particular thesis, eight effects of delay have been adopted. These are time overrun, budget overrun, Poor quality completed project, bad Public relations, litigation, disputes and claims and arbitration and total abandonment of the project. Likert rating scale method (The contribution of each variable to delay in the project on a rating scale of: E.S. = Extremely Significant (5), V.S. = Very Significant (4), M.S. = Moderately Significant (3), S.S. = Slightly Significant (2), N.S. = Not Significant (1)) has been used to collect respondents' opinion on the factors and effects of delay. The variables in the questionnaire were adapted from the studies cited in the literature review.

3.9 Data analysis

After the data has been collected from the required respondents and interviewees, the datum were then analyzed quantitatively with appropriate tools of data analysis. First, Relative Importance Index is used to rank causes and effects of delay (Chan & Kumaraswamy 1997: Aibinu & Jagboro 2002: Odeh & Battaineh 2002: Al-Tabtabai 2002). It is used to rank the different causes of delays from the perspective of clients, consultants, contractors and other stakeholders. In addition, weighted averages of each RII were evaluated with client, consultants and contractor's response ratio.

This can be represented as:

Relative Importance of Index,

$$RII = \frac{1n1+2n2+3n3+4n4+5n5}{5(n1+n2+n3+n4+n5)}$$

Where, n1 = number of respondents who answered strongly disagree,

n2 = number of respondents who answered disagree,

n3 = number of respondents who answered neutral,

n4 = number of respondents who answered agree, and

n5= number of respondents who answered strongly agree.

And Weighted averages of RII given as: RII of each factor clients' view * clients' response ratio+ RII of each factor consultants' view * consultants' response ratio + RII of each factor contractors' view * contractors' response ratio.

WA of RII= (RII of i factor, clients' view)*clients' response ratio + (RII of i factor, consultants' view)*consultants' response ratio + (RII of i factor, contractors' view)* contractors' response ratio, where i=1 to 35, and clients, consultants and contractors' response ratio were 10/39=0.26, 9/39=0.23 and 20/39=0.51 respectively.

CHAPTER FOUR: DATA PRESENTATION (ANALYSIS) AND FINDINGS

4.1 Introduction

This chapter presents the findings of the study made on the causes and effects of delay in ORA. This is presented in the form of descriptive and analytical methods through document reviews, questionnaires and a focus group discussion.

4.2 Brief description of respondents

4.2.1 Response rate

Table 4.1 Summary of response rate

	Contractors			Consultants			Client	Total
	State owned	Privates	Total	State owned	Privates	Total		
Questionnaire distributed	11	12	23	5	7	12	10	45
Questionnaire returned	11	9	20	5	4	9	10	39
Response rate (%)	**100%**	**75%**	**87%**	**100%**	**57%**	**75%**	**100%**	**87%**
Total	**20**		**87%**	**9**		**(75%)**	**10 (100%)**	**39(87%)**

Source: *own document review*

Questionnaires were distributed to forty five (45) experts of client, consulting firms and, contracting companies. Responses to the questionnaire were then collected and analyzed. A total of 39(87%) responses (respondents were 10 from client, 9 from consultants, and 20 from contractors) were received with a response rate of 87%. All responses given were complete and returned. According to Burgess, (2001) in a questionnaire survey research, a responses rate of 30% -40% is acceptable for data analysis. The shortfall in the required sample size implies that, conclusions in this study may be considered as perception of the respondents only.

From the summarized table above, it can be said that ample questionnaire were returned to analyze the data and infer in this study.

4.2.2 Responsibility of the respondents and work experiences

The respondents were asked to reply to their responsibility in the organization to know the relevance to the subject under investigation. Accordingly, 3% were owner of organization or managing director, 5% of them were process owners, and 51% of them were contract administration team, 8% were resident engineers, 21% were site supervisor /Counterpart and 13% were other (team leader/project manager/materialists). It can be said that fair relevant work type were represented.

Work experience of the respondents was thought to be very crucial in the target population. Accordingly, 33% of them worked for 1-5 years, 41% of them worked for 6-10 years, 10% of them worked for 11-15 years and the rest 15% of them served for more than 15 years. It can be said that, respondents have had good working experience in road construction area to distinguish and discuss the subject indicated in this research.

4.3 Extent of delay

From the reviewed document the time delays ranged from a minimum of 3% to the maximum of 259% of the contract time. Based on the result found, a summary of delayed time of the selected projects were shown in Table 4.1 below.

Table: 4.2 Accomplishment and time elapsed of some road projects in ORA

No	Project Name	Zone	Total Length (km)	Contractor	Date of Commencement	Contract Period (days)	Actual completion date	Date of hand over (provisional)	Total days (Delay)	% delay
1	*Gelan-Insilale-L/Dadhi*	*Special Zone, Sur. Finfinne*	42.1	*ORCE*	-	1095	Dec.2012	15-Aug, 2016	975	189%
2	*Sheno-Deneba*	*North Shoa*	56	*ORCE*	-	2036	April 2016	19, June 2016	65	103%
3	*Kula-Dereba-Semar*	*Arsi*	34	*ORCE*	-	1300		10, Aug, 2013	460	135%
4	*Shambo town int. Asphalt*	*H/G/Wollega*	6	*Dirriba Defersha G.C*	-	450	Nov 2015	30, Jan 2016	1156	357%
5	*Hinde Bridge*	*E/Wollega*	24m	*Negat GC*	-	450	Ongoing and (>621days excluding original contract time has been elapsed up to the review made).			149%
6	*Kurbi-Qiwe-Dado*	*E/Hararge*	41.25	*ORCE*	Oct, 2010	925	Ongoing and (>2400 days excluding original contract time has been elapsed up to the review made)			359%
7	*Hidi Lola Sololo*	*Borena*	34	*OWWCE*	22nd Jan 2014	1095	Ongoing and (120 days excluding original contract time has been elapsed up to the review made)			111%
8	*Alge Sachi-Mako-Degga*	*Ilu Ababbor*	59	*Alemayehu Ketama GC*	Jan. 2013	730	Ongoing and (>850 days excluding original contract time has been elapsed up to the review made)			216%
9	*Yayo-Elemo*	*Ilu Ababbor*	26	*ORCE*	July, 2013	720	Ongoing and (>645 days excluding original contract time has been elapsed up to the review made)			190%
10	*Gelila-Waja-Mender 10*	*E/Wollega*	60.18	*Shed GC*	Dec.2012	1095	Ongoing and (>485 days excluding original contract time has been elapsed up to the review made)			144%

Source: *own document review*

Document revealed that both completed and ongoing projects experienced delays with different magnitude of days of delay. It can also be said that many road construction projects which were constructed by different contractors did not get completed on time. To mention and reinforced the idea, Kurbi-Qiwe-Dado Ongoing project run more than 2400 days excluding original contract time has been elapsed. This can be expressed 259% beyond the completion date. Gelila-Waja-Mender 10, which run up to 44% beyond its completion date, Alge Sachi-Mako-Degga, which also rise by 116% beyond the agreed completion date are among the projects.

Projects' completion report attests that the main reasons for delay in roads construction projects are right of way problem, finance and payments of completed work, slow decision-making by owners, and

design change. From the table above, *Alge Sachi-Mako-Degga, Yayo-Elemo, Gelan-Insilale-L/Dadhi, Sheno-Deneba, Kula-Dereba-Semar, Kurbi-Qiwe-Dado and Hinde Town Bridge* are among the projects which were delayed because of design related change, beside to other internal and external problems. *Shambu town internal asphalt* construction specifically faced delay because of right of way problem.

In general, a project was expected to be completed in the agreed time period (i.e. 100%). A 359% of delay (i.e. 259% beyond pre agreed contractual time) implies an extended and highly delayed project completion time. Accordingly, from the above table, *Kurbi-Qiwe-Dado* rural road project and *Shambu town internal* asphalt construction can be a good representative of the existence delay.

4.4 Causes of delay

To identify the causes of delay, discussion were made with key informant of contract administration team, and the financing body (staffs of BoFED). According to them, the main causes of delay of roads construction projects in Oromia pertinent to ORA road projects were identified as: right of way problem, design problem, constraint in project's annual budget that matches with their contractual/completion time (inadequate budget allocation versus contractors plan), capacity of consultants to manage contract and incapability of some contractors.

In addition to focus group discussion, causes of delay were identified with questionnaire survey. Accordingly, thirty five causes of delay were identified from reviewed literature. These causes of delays were all included in the questionnaires, the importance which were evaluated by the respondent's scale of 5 (extremely significant) to 1 (Not significant). Then those lists of causes were ranked by calculating the Relative Importance Index (RII). The weighted RII values of each factors causing delay with respective respondent ratio of client, consultant and contractor was also calculated. Table 4.3 below shows Relative Importance Index and weighted RII of factors causing delay.

Table 4.3 RII of factors causing delay from the point of views of client's, contractors and consultants

No	Delay factor description	Clients View		Contractors View		Consultants View		Weighted Average of RII	Rank
		RII	Rank	RII	Rank	RII	Rank		
1	Delay to deliver the site (Right of way problem)	0.82	1	0.73	3	0.73	1	0.75	1
2	Financial problems inspections	0.64	5	0.76	1	0.73	1	0.72	2
3	Equipment availability and failure	0.64	5	0.76	1	0.69	3	0.71	3
4	Suspension of work by owner or contractor	0.64	5	0.74	2	0.67	4	0.70	4
5	Weather condition	0.70	2	0.71	5	0.64	5	0.69	5
6	Change order	0.58	8	0.74	2	0.67	4	0.68	6
7	Slow decision-making by owners	0.66	4	0.72	4	0.58	8	0.67	7
8	Finance and payments of completed work	0.52	11	0.74	2	0.64	5	0.66	8
9	Discrepancies between contract documents	0.50	12	0.72	4	0.69	3	0.66	8
10	Unrealistic imposed contract duration	0.68	3	0.63	10	0.60	7	0.64	9
11	Site management	0.60	7	0.62	11	0.71	2	0.64	9
12	Preparation and approval of drawings	0.52	11	0.70	6	0.62	6	0.64	9
13	Unforeseen ground condition	0.56	9	0.73	3	0.47	12	0.63	10
14	Construction methodology	0.62	6	0.62	11	0.62	6	0.62	11
15	Improper planning	0.56	9	0.62	11	0.69	3	0.62	11
16	Poor contract management (Client Related)	0.56	9	0.65	9	0.56	9	0.60	12
17	Shortage in material	0.50	12	0.63	10	0.67	4	0.60	12
18	Quality assurance/control	0.48	13	0.66	8	0.62	6	0.60	12
19	Absence of consultant's site staff	0.56	9	0.66	8	0.51	10	0.60	12
20	Contract management (Consultant Related)	0.54	10	0.63	10	0.60	7	0.60	12
21	Labor supply	0.44	14	0.66	8	0.58	8	0.58	13
22	Lack of experience on the part of the Consultant	0.44	14	0.65	9	0.58	8	0.58	13
23	Waiting time for approval of tests and inspections	0.48	13	0.67	7	0.47	12	0.58	13
24	Poor communication and coordination	0.54	10	0.61	12	0.44	13	0.55	14
25	Lack of communication between the parties	0.44	14	0.59	13	0.51	10	0.53	15
26	Major disputes and negotiations	0.42	15	0.62	11	0.47	12	0.53	15
27	Low bid (Contractor Related)	0.44	14	0.54	15	0.49	11	0.50	16
28	Quality of material	0.40	16	0.50	16	0.62	6	0.50	16
29	Owner interference	0.38	17	0.59	13	0.44	13	0.50	16
30	Regulatory changes	0.44	14	0.55	14	0.44	13	0.50	16
31	Use of standard form of contract	0.40	16	0.50	16	0.51	10	0.48	17
32	Low bid (Consultant Related)	0.40	16	0.54	15	0.40	14	0.47	18
33	Inadequate contractor experience	0.38	17	0.48	17	0.47	12	0.45	19
34	Mistakes during construction	0.34	17	0.42	18	0.40	14	0.39	20
35	Subcontractors	0.30	18	0.28	19	0.40	14	0.31	21

Source: own survey

4.4.1 Client's view

Table 4.3 shows that clients ranked delay to deliver the site (Right of way problem) as the first factor that cause delay with a relative importance index 0.82. This factor also ranked first by consultants. Different sources and discussion made with ORA's staffs also confirmed that right of problem was the prominent factor in causing roads construction completion in ORA.

Figure 3 below shows electric pole not cleared from the site, reveals the presence of obstacles/right of way problem/ that it was the cause of delay in roads construction projects in Oromia pertinent to ORA. Next to right of way problem was weather condition, with a relative importance of 0.70. Unrealistic imposed contract duration also ranked as third factor to cause delay in road construction in ORA having RII value of 0.68. Slow decision-making by owners with RII 0.66 can be mentioned at fourth level. These factors of causes were among the top that contribute to delays and hinder the timely completion of road construction projects in ORA. Among the rest factors, subcontractors and mistakes during construction were considered to be less delay causing factors in roads construction project, according to clients' response. As responded by respondents, mistakes during construction and subcontractors were contribute delay in minimal.

Figure 3: Obstruction along *Gelila-Waja-Arkumbe-Mender 10* road Project-*E/Wollega* (60.18 km).

Removal of obstruction from road project was not completed till the survey made for this study, while number of delayed days run more than 485, till this review made. Hence, it can be said that right of way problem was the dominant factor on roads construction projects in Oromia pertinent to ORA road projects.

4.4.2 Contractor's view

Contractor's response towards factors causing delays in roads construction projects in Oromia pertinent to ORA road projects showed that financial problems inspections (difficulties in financing project by contractor) and equipment availability and failure (RII 0.760) are the first ranked factors causing delay.

According to contractors' response, financial problems that are related to contractors rises from mismanagement of financial resources in such a way that diverting the finance that was generated by one project to other project which they are running or other than road projects. In addition to payments of completed work, suspension of work by owner or contractor and change order are ranked at second, with RII 0.730.

Obviously, financial constraints by the client to furnish payments of completed work and this can happen due to inadequate budget allocation versus contractor's plan, as the execution of projects run over annual allotted budget. Delay to deliver the site (right of way problem) and unforeseen ground condition are seen to the third delay causing factors by contractors (RII 0.730). Discrepancies between contract documents and slow decision-making by owners with RII 0.720 and "Weather condition" RII of 0.710 found to be were fourth and fifth ranked factor respectively. Discrepancies between contract documents are the cause that emerges from contract document and the actual work seen on ground. Slow decision making by client was unresponsiveness to the decision seeking issues of the project. Most western zones of the region (*Ilubabor*, *Jimma* and *Wollega* zones) suffer from weather condition of prolonged rainy season, contributing to delay in road projects. Mistakes during construction and subcontractors are considered as non significant factor in almost all stakeholders who were participated in responding to this research.

4.4.3 Consultant's view

Consultants also revealed that delay to deliver the site (right of way problem), and financial problems inspections (difficulties in financing project by contractor are among the top delay causing factors, with RII 0.733. Delay to deliver the site (right of way problem), as it was ranked first by clients' respondents was also recognized as the first problem causing road construction and completion indicating the obstructions along the road construction has a significant role in setting back the construction activities. In addition, financial problems that are related to constructors are found to be the main factor in causing delay. According to the consultants written response, contractors tend move/divert the finance that was generated by one project to other project which they are constructing or other than road project.

The second factor that causes delay on roads construction projects in Oromia pertinent to ORA road projects was "Site management" with RII 0.711. Thirdly, Equipment availability and failure of machineries, improper planning, and discrepancies between contracts documents with RII 0.689 are also referred as the factors to cause delay. The Equipment availability and failure was directly related to the contractors, as equipments were the main inputs for construction activities for contractors. Improper planning also attest that the importance of planning and time scheduling to deliver the project on time.

The research revealed that discrepancy between contracts documents lead to delay in timely construction completion of road projects. Respondents written response also showed that the discrepancy between unit of measures of items and quantity differences in some contract documents made inconvenience in timely accomplishment of roads projects. Suspension of work by owner or contractor, change order and shortage in material all with RII 0.667 are the fourth factors to cause delay. Finance and payments of completed work and weather condition, both with RII 0.644 are the fifth factors to cause delay in ORA.

Consultants reinforced those factors of causes of delay that were listed as top by client's such as delay to deliver the site (right of way problem) was the main problem in contributing a great share of cause of delay. Mistakes during construction and subcontractors and low bid are among the least factors to cause delay.

4.5 Causes of delay reflected by weight of RII

According to the weighted RII of factors, delay to deliver the site (Right of way problem), financial problems inspections, equipment availability and failure, suspension of work by owner or contractor and weather conditions were the most delay causing factors of roads construction projects in Oromia pertinent to ORA road projects.

Unresolved obstruction from road project site/right of way problem/ can be said that the dominant factor on roads construction projects delay in Oromia pertinent to ORA road projects. Since contractors shift finance that was generated by one project to other project which they are constructing or other than road project, difficulties to finance the project may happen which lead to delay. Absence and inadequacy of equipments were also the main causes of delay, as equipments are the key input of projects. Suspension of work by owner or contractor was also a direct factor cause of delay. Among the first five causes, weather condition was the dominant factor. Most western zones of Oromia region (*Ilubabor*, *Jimma* and *Wollega* zones) suffer from weather condition of prolonged rainy season, contributing to delay in road projects.

4.6 Tests of agreement on causes of delay among stakeholders

In this section respondents' response was tested for correlation to see if there is difference in ranking between two groups of respondents. The groups are Clients versus Contractors: Clients versus Consultants and Contractors versus Consultants: on the variables of factors of delay and their rate of occurrence.

The correlation coefficient varies between +1 and -1, where +1 indicates a perfect positive agreement among the groups, implying good correlation), while -1 result from a perfect negative relationship among the groups, indicate little or no correlation). According to Odeh and Battaineh (2002), the higher the value of Rho (ρcal) is approaching 1 or -1, the stronger the association between the two sets of ranking.

The Spearman's rank correlation coefficient Rho (ρcal) is used to measure and compare the association between the rankings of two parties for a single cause of delay, while ignoring the ranking of the third party. And also it is a measure of correlation between two series using the ranks rather than the actual values (Kottegoda 1997, Coakes et al.2009) and can be calculated as:

Rho (ρcal) =

$$1- \frac{6x(\Sigma di^2)}{N(N^2-1)}$$

Where:

Rho (ρcal) = Spearman rank correlation coefficient

di = The difference in ranking between each pair of factors

N = Number of factors (variables)

Results show that the agreement between client and contractor had a coefficient (0.92), agreement between the contractors and the consultants with a coefficient (0.91) and at last a coefficient (0.90) for the agreement between the consultants and the client, as shown in table 4.8 The agreements between three parties have a high coefficient value (implying a strong positive relationship, approaching to a unity).

Accordingly, to test the relationship with a 95% confidence interval, 0.05 level of significant and with a sample size of 23 the hypotheses can be set in the following manner.

The Null Hypothesis (HO): -There is no significant agreement in the ranking of causes of delay between two groups of respondents.

The Alternative Hypothesis (HA):-There is significant agreement in the ranking of causes of delay between two groups of respondents. The spearman correlation coefficient (ρ) was calculated using the above formula and tabulated as shown below in Table 4.4 below.

Table 4.4 Calculated summary of correlation test on the ranking of causes delay

Critical values and Significance level, along with Sample size (n)	***Respondents/groups***		
	Clients Vs Contractors Ranking	***Client Vs Consultant's Ranking***	***Contractor's Vs Consultant's Ranking***
1- $\frac{6x(\Sigma di^2)}{N(N^2-1)}$ [Rho(ρcal)]	***0.92***	***0.90***	***0.91***
Critical value of ρ, @ 95% Confidence interval, n=39≈40, and significance level @ 0.05	***0.2640***	***0.2640***	***0.2640***
Accept/Reject H_o point	***Reject H_o***	***Reject H_o***	***Reject H_o***

Since ρcal for the three groups (Clients Vs Contractors =0.92, Client Vs Consultant's =0.90 and Contractor's Vs Consultant's =0.91) is greater than the critical value of 0. 2640 at 5% significance level and sample size of 39) then we reject the null hypothesis and accept the alternative hypothesis. (There is an agreement in the ranking of causes of delay between two groups of respondents), we can conclude that there is statistical evidence to suggest that there is a positive correlation between these rankings.

4.7 Effects of delay

Literature review showed that there are eight potential effects of delay. Respondents were asked to rate these effects of road construction projects delays in ORA. Accordingly, time overrun (extension of time), and budget/cost overrun, were the dominating effects of delay. Next Clients' distinguished bad public relations next to overrun and budget overrun. Bad public relation was also mentioned as one of the effects delay while focus group discussion was made.

Dissatisfaction /annoyance of the community because of delay both in construction (absence of access to) and timely completion of road projects brought ORA to bad public relation.

Table 4.5 RII and Ranking of effects of delay based on clients', contractors' and consultants' response

Owners' view			Contractors view			Consultants view		
Effects of delay	**RII**	**Rank**	**Effects of delay**	**RII**	**Rank**	**Effects of delay**	**RII**	**Rank**
Time overrun	0.860	**1**	Time overrun	0.910	**1**	Time overrun	0.933	**1**
Budget overrun	0.640	**2**	Budget overrun	0.820	**2**	Budget overrun	0.867	**2**
Bad Public Relations	0.620	**3**	Disputes and claims	0.580	**3**	Disputes and claims	0.556	**3**
Disputes and claims	0.620	**3**	Total abandonment	0.580	**3**	Bad Public Relations	0.533	**4**
Total abandonment	0.560	**4**	Poor quality completed project	0.570	**4**	Poor quality completed project	0.467	**5**
Arbitration	0.460	**5**	Bad Public Relations	0.570	**4**	Litigation	0.444	**6**
Poor quality completed project	0.440	**6**	Arbitration	0.570	**4**	Total abandonment	0.444	**6**
Litigation	0.440	**6**	Litigation	0.540	**5**	Arbitration	0.422	**7**

Table 4.5 shows that dispute and claims with RII 0.580, contractors and 0.556 by consultants and 0.620 by owners' were also the third important effects ranked. Other effects of road construction project delays identified and ranked include: total abandonment with RII = 0.580 and RII 0.560 respectively were became third important effects of delay ranked by contractors. According to the respondents/stakeholders litigation and arbitration were not significant effects of delay on roads construction projects in Oromia pertinent to ORA road projects.

CHAPTER FIVE: CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

Following the literature review and the research data analyzed discussed in the previous chapters, this fourth chapter summarizes the main findings and the emerging issues from the study. On the basis of these findings, conclusion was drawn and some recommendations were forwarded as some possible actions that can help manage the emerging issues.

Contractual documents of road projects in the authority and correspondence letters, particularly permits to time extension in ORA reveal that delays occur in almost all construction projects and the magnitude of these delays varies considerably from project to project. Accordingly, these documents attest that the extent of roads construction delay runs from 3-259%.

The weighted RII of factors revealed that: delay to deliver the site (Right of way problem), financial problems inspections, equipment availability and failure, suspension of work by owner or contractor and weather conditions were the most delay causing factors of roads construction projects in Oromia, pertinent to ORA road projects.

Respondents also forwarded the following delay causing factors with open-ended questionnaire, besides the ranking factors. These are: having more than one project at a time led the contractors lose their capacity, that in turn lead to delay in projects, technical competency of client to administer contract, and project managers, shortage of cash flow of contractors, limited budget of client, shortage of resources, (finance, human, water, material), design problem (especially projects of ORCE) weather condition are highly emphasized. Improper planning, poor communication between contractor and client, client and consultants, Lack of commitment of client to alleviate decision making procedure, forward alternative solution, Change order, that arise due to design problem and additional work order, Suspension of payments was among the main causes that contribute to delay according to the respondent's point of view.

Effects of construction delay have been also being investigated in the same manner and the results were calculated using RII. Hence, Time and Budget overrun have been found to be the two most dominant effects caused by delays in Oromia roads construction projects pertinent to ORA road projects.

5.2 Recommendations

Based on the findings of the research, the following recommendations are forwarded which were expected from key stakeholders of road construction projects in Oromia, particularly ORA Road Projects.

- The client should make ready the site of work along with appropriate design before all and make ready for the proper planning, and allocate appropriate budget, that align with the schedule of the construction contract.
- The regional government along with the road authority should come to solution of resolving right of way problems that calls compensations.
- Client and contractor should avoid suspension of work that lead for additional time.
- While selecting contractors, clients should not select contractors based only on the lowest bid. It should rather look for their working experience, key personnel, works executed similarly in nature, equipment holding, with a good reputation, financial capacity, work load and experience in modern construction technology before choosing a contractor.
- Client should minimize change orders as in order to avoid any time overrun and its consequences.
- Appropriate communication channel and coordination between the stake holders must be adopted by the contracting parties to ensure smooth flow of information to avoid unnecessary delays or wrong instruction. In this regard, since Consultant serves as an intermediary between client and contractors their communication skill is essential to aid smooth flow of information to other contracting parties.
- Realistic duration and cost must be set for project.
- Client, Contractor and consultants should plan for their work considering weather condition of the project vicinity.
- Training course should be arranged timely for experts and engineers specially working on contract administration along with sophisticated software aids.
- Consultants should assign a qualified technical staff to manage the project in a good manner, answer any question raised by contractor, and in order to be able to overcome any technical or management problems that may occur.
- The contractor should have a master plan/work program comprising of resources schedule, plant and equipment schedule.

- Contractors should closely follow up equipment failure (breakdown) and make ready the equipments that lack maintenance. Qualified workers should be assigned for regular equipments maintenance.
- Government has to initiate intellectuals to do researches regarding causes of time overrun and its consequences
- For further research to be conducted number of projects to be included in the sample and respondents should extend to different sites of the project and adequate time should be given for further investigation.

The following are recommended areas for further research in ORA in particular:

I. Investigating factors that cause delays in road projects during the design stage,

II. Success Factors in Roads Construction Projects of Oromia National Regional State.

References:

Abdullah (2013). Factors Affecting Cost Overrun in Road Construction Projects in Saudi Arabia (on line) Avialable http://www.ijens.org Retrieved on 9 April, 2017

Abubeker Jemal Mustefa, Factors Affecting Time and Cost Overrun in Road Construction Projects in Addis Ababa: Msc, thesis Addis Ababa, Ethiopia, 2015.

Addisu Mosisa, Contribution of Small, Medium and Micro Enterprise Contractors on road construction projects in Ethiopia: Msc, thesis Addis Ababa, Ethiopia, 2013.

Ahmed, S., Azher, S., Castillo, M. and Kappagantula, P. (2002) Construction delays in Florida; an empirical study, Florida, 2002.http://www.cm.fiu.edu/publication/Delays .pdf, Retrieved on 2 June, 2017

Alaghbari, W., Kadir, M. A., & Salim, A., E. (2007). The significant factors causing delay of building construction projects in Malaysia. Construction and Architectural Management, 14(2), 192–206. http://dx.doi.org. Retrieved on 13 April, 2017

Assaf, S. A. and Al-Hejji, S. (2006), 'Causes of delay in large construction projects'. International Journal of Project Management, 24(4):349-357.

Assaf, S. A., Al-Khalil, M, and Al-Hazmi, M. (1995), "Causes of Delay in Large Building Projects", ASCE, Journal of Management in Engineering, 11(2):45-50,

Assaf, S.A. and Mohammed, A. (1996), 'Causes of delay in large building construction projects'. Journal of Management in Engineering, 11(2): 27-55;

Burgess, T. F., 2001. A general introduction to the design of questionnaires for survey research. Leeds: University of Leeds press. Or Bernadette.sunjka@wits.ac.za

D. Chan, M. Kumaraswamy, A comparative study of causes of time delays in Hong Kong construction projects, International Journal of Project Management 15 (1) (1997) 55-63.

Divya.R. (2015) Causes, Effects and Minimization of Delays in Construction Projects, (on line). Available www.internationaljournalssrg.org pp 47-53. Retrieved on 3 April, 2017

Emmenegger R. 2012. *The Roads of Decentralization: The History of Rural Road Construction in Ethiopia.* NCCR North-South Dialogue 39. Bern and Zurich, Switzerland: NCCR North-South.

Enshassi A., Lisk R., Sawalhi I. and Radwan I., 2003, Contributors to construction delays in Palestine, The Journal of American institute of constructors, Vol. 27, No. 2, pp. 45-53.

Ethiopian Roads Authority (ERA). 2011. Road Sector Development Program Performance: Thirteen Years Performance and Phase IV.

Ethiopian Roads Authority (2005). DCI: How is it performing over the RSDP period; Paper prepared for midterm review of RSDP, Planning & programming Division of ERA.

Fetene Nega Causes and Effects of Cost Overrun on Public Building Construction Projects in Ethiopia; Msc, thesis Addis Ababa, Ethiopia, 2008.

Frimpong, Y. and J. Oluwoye, Significant factors causing delay and cost overruns in construction of groundwater projects in Ghana". Journal of Construction Research, 2003. 4(02): p. 175-187.

Frimpong, Y., Oluwoye, J.and Crawford, L. (2003). Causes of delay and cost overruns in construction in developing countries", International Journal of project management.

Fugar, F. D. K., & Agyakwah, B. A. B. (2010). Delays in Building Construction Projects in Ghana, Australasian Journal of Construction Economics and Building, 10(1), 103-116.

Getachew Ligdi Causes of delays and their impacts on roads constructions in Oromia Region; A Case Study on the delays and their impacts in Jimma and Shambu town asphalt roads construction.

Johnson, J.W. and LeBreton, J.M. (2004) History and Use of Relative Importance Indices in Organizational Research. Organizational *Research Methods*, 7, 238-257. http://dx.doi.org/10.1177/1094428104266510. Retrieved on 11 April, 2017

Kikwasi, G.J. (2012) 'Causes and effects of delays and disruptions in construction projects in Tanzania', Australasian Journal of Construction Economics and Building, Conference Series, 1 (2) 52-59

Le-Hoai, L., Lee, Y.D. and Lee, J.Y. (2008), Delay and Cost Overruns in Vietnam Large Construction Projects: A comparison with other selected countries", KSCE Journal of Civil Engineering Construction Architecture Management Journal, 5 (3), 252–60

Memon, A. H. (2014). Contractor Perspective on Time Overrun Factors in Malaysian Construction Projects. International Journal of Science, Environment and Technology, 3(3), 1184-1192

M. K. Somiah1, (2015). Relative Importance Analysis of Factors Influencing Unauthorized Sitting of Residential Buildings in the Sekondi-Takoradi Metropolis of Ghana Journal of Building Construction and Planning Research, 2015, 3, 117-126

Mohamed B. A Study of Project Delay in Sudan Construction Industry: Msc. thesis University Tunku Abdul Rahman, 2015.

Mohammed, K. A. & Isah, A. D., (2012). Causes of Delay in Nigerian Construction Industry. Interdisciplinary Journal of Contemporary Research in Business, 4(2) 785- 794

Motaleb, O and Kishk, M (2010) An investigation into causes and effects of construction delays in UAE. In:Egbu, C. (Ed) Procs 26th Annual ARCOM Conference, 6-8 September 2010, Leeds, UK, Association of Researchers in Construction Management, 1149-1157. And Mohammed Kishk.

Msafiri Atibu Seboru. An Investigation into Factors Causing Delays in Road Construction Projects in Kenya. American Journal of Civil Engineering. Vol. 3, No. 3, 2015, pp. 51-63. doi:

N. Mansfield, O. Ugwu, T. Doran, Delay causes and cost overruns in Nigerian construction projects, International Journal of Project Management 12 (4) (1994) 254-260.

Noulmanee A, Wachirathamrojn J, Tantichattanont P, Sittivijan P.1999. Internal causes of delays in highway construction projects in Thailand. www.ait.c1et.com Accessed 9/5/2011

OECD (2006) Promoting Pro-Poor Growth: Infrastructure. OECD, Paris. (www.oecd.org/dac/poverty). Retrieved on 12 March, 2017

Oromia Roads Authority, (2009) Annual Plan

Owolabi James (2014). Causes and Effects of Delay on Project Construction Delivery time (on line). Available http://eprints.covenantuniversity.edu.ng. Retrieved on 9 April, 2017

P.K. Joy (2016) *Hand book of Construction Management*, Second edition Published in India by Trinity press.

Regional Road Network Development Study Final Main Report, main document, Volume I. June 2012.

S. Assaf, M. Al-Khalil, M. A-Hazmi, Delay causes in large building construction projects, Journal of Management in Engineering, ASCE 11 (2) (1995) 45-50.

Schöbel, A. (2001), A model for the delay management problem based on mixed integer programming. Electronic Notes in Theoretical Computer Science 50(1). Proc ATMOS 2001. http://www.elsevier.nl/locate/entcs/volume50.html. Retrieved on 5 May, 2017

Stumpf, G. (2000). Schedule delay analysis. Construction Engineering Journal. 42(7):32–43 Syed, M.A., A. Salman, K. Pragnya and G. Dharam, (2003). "Delays in construction: a brief study of Florida construction industry", Proceedings of the 39th Annual ASC Conference, (pp. 257-66). Clemson University,Clemson, SC,

Tadesse Ayalew, (2009), Causes and Effects of Variations in Ethiopian Federal Road Projects, MSc thesis, Addis Ababa University, Civil Engineering Department.

Tekle Hagos, Malet Shewangzaw (2012). Historical Background of the Construction Industry (On line) Available http://www.abyssinialaw.com. Retrieved on 9 May, 2017

Torbica, Z.M and Stroh, R. (2001) in Xiao, H., and Proverbs, D. (2002b). The Performance of Contractors in Japan, The UK ant The USA: An Evaluation of Construction Quality. International Journal of Quality and Reliability Management, vol.19, No.6, pp 672-687.

Tushar Khattri, Sohit Agarwal, Vaishant Gupta, Mukesh Pandey, 2016. Causes and Effects of Delay in Construction Project. International Research Journal of Engineering and Technology (IRJET). Volume: 03.

Vagias, Wade M. (2006). Likert-type scale response anchors. Clemson International Institute for Tourism & Research Development, Department of Parks, Recreation and Tourism Management. Clemson University.

APPENDIX :I Background and Letter

Introduction

This questionnaire was prepared to obtain information from key informants with semi- structured questions. The information was required for the academic research entitled "Causes and effects of delay in Oromia Roads Construction Projects Pertinent to ORA Road Projects.

Causes and effects of delay in Oromia Roads Construction Projects pertinent to ORA road projects was going to be conducted as partial fulfillment of MA in construction management. The main objective of this research was to identify the main causes/factors/ that lead to delay and the effects /Consequences/ this delay on the achievements of the regional road network plan. Your response, in this regard, is highly valuable and contributory to the outcome of the research. All feedback will be kept strictly confidential, and will be utilized only for this academic research purpose.

The questionnaire is divided into three parts. The first part of the questionnaire introduces the participants to the origin, the purpose of the survey. The second part includes the list of the identified factors that might affect time overrun in road construction projects. The respondents are asked to assess the degree of impact of the delay factors. At the end of the second part of the questionnaire, an open-ended question is provided to list any other delay factors in a specified region to be listed out other comments for improvement, suggestions or recommendations to prevent the delays, if any.

Thank you in advance,

Firdissa Yadeta,
Post graduate student, Construction Management
A.A Science and Technology University, College of Natural and Social Science:
Department of Business and Management:
Tel:+251-911-80-79-93, e-mail: *frdbywaqtu@yahoo.com*
Addis Ababa

ADDIS ABABA SCIENCE AND TECHNOLOGY UNIVERSITY COLLEGE OF NATURAL AND SOCIAL SCIENCE DEPARTMENT OF BUSINESS AND MANAGEMENT:

APPENDIX:II Questionnaire Survey for Research

(For Client, Contractors and Consultants)

SECTION A: GENERAL INFORMATION

1. Name of Organization: ----------
2. Responsibility of State respondent

Client ☐ Contractor ☐ Consultant ☐

3. Respondents designation:

Owner of organization/Managing director ☐ Process Owner ☐ contract Administration ☐

Resident Engineer ☐ Site Supervisor/Counterpart ☐ other_____ ☐

4. Relevant working experience (years):

1-5Yrs ☐ 6-10Yrs ☐ 11-15Yrs ☐ >15Yrs ☐

5. Type and size of projects:

5.1. Type of Road you are involved in

Rural Road (DS6-8) ☐ Asphalt (AC) ☐ Asphalt (DBST) ☐

5.2. Total length of the Road(km) _____

5.3. Total cost of the project (Agreed amount in Birr) _____

5.4. Actual cost of the project (amount in Birr) _____

6. Specific to Contractors:

6.1. Level/category/ of the contractor:

Level 1 ☐ Level 2 ☐ Level 3 ☐

7. For how long your company involved in road construction, since its establishment of your business organization?

1-4Yrs	5-10Yrs	11-15Yrs	>15Yrs
☐	☐	☐	☐

SECTION B: Questionnaire Survey for Research (For Client, Contractors and Consultants)

Part I:

1. A Project you are involved is:

Completed	Currently under Construction
☐	☐

2. Concerning the completed projects, did the project you involved in before:

Completed a head time?	Completed on time?	Delayed?
☐	☐	☐

3. If your answer for Question No. 1 is delayed, by how much day it delayed?

<50 days	50-150days	150-250days	250-350days	>350days
☐	☐	☐	☐	☐

4. Time elapsed yet for ongoing projects:

<50 days	50-150days	150-250days	250-350days	>350days
☐	☐	☐	☐	☐

5. Do you think that these delays have an impact on the total cost of the project?

Yes	No
☐	☐

6. If your answer for Q. No 5 is yes, by how much Percent does the cost overrun?

<25%	<25-50%	50-75%	>75%
☐	☐	☐	☐

II.during the period of construction, which factors you think contribute to delay in the project?

Please indicate the significance of each cause by ticking the appropriate boxes. You can add any remarks relating to each cause on the last row e.g. as to the reasons, the critical factors or the suggested solutions.

E.S. = Extremely Significant (5): V.S. = Very Significant (4): M.S. = Moderately Significant (3): S.S. = Slightly Significant (2): N.S. = Not Significant (1)

No	Factor	E.S. (5)	V.S. (4)	M.S. (3)	S.S. (2)	N.S. (1)	Additional Comment /Suggestion/ If any
	A. Project Related						
1	Discrepancies between contract documents						
2	Suspension of work by owner or contractor						
3	Change order						

B. Owner Related

1	Delay to deliver the site (Right of way problem)	E.S. (5)	V.S. (4)	M.S. (3)	S.S. (2)	N.S. (1)	Additional Comment /Suggestion/ If any
2	Poor communication and coordination						
3	Finance and payments of completed work						
4	Owner interference						
5	Slow decision-making by owners						
6	Unrealistic imposed contract duration						
7	Poor contract management						

	Others,						
C	**Contractor**	**E.S. (5)**	**V.S. (4)**	**M.S. (3)**	**S.S. (2)**	**N.S. (1)**	**Additional Comment /Suggestion/ If any**
1	Financial problems inspections.						
2	Subcontractors						
3	Site management						
4	Construction methodology						
5	Improper planning						
6	Mistakes during construction						
7	Inadequate contractor experience						
8	Quality of material						
9	Shortage in material						
10	Labor supply						
11	Low bid						
	Others,						

No	Factor	E.S. (5)	V.S. (4)	M.S. (3)	S.S. (2)	N.S. (1)	Additional comment /Suggestion/ If any
D.	**Consultant**						
1	Absence of consultant's site staff						
2	Lack of experience on the part of the Consultant						
3	Contract management						
4	Preparation and approval of drawings						
5	Quality assurance/control						
6	Waiting time for approval of tests and inspections						
7	Low bid						
8	Use of standard form of contract						
	Others if, (to be listed and marked in the same way						
E	**External factors**						
1	Equipment availability and failure						
2	Major disputes and negotiations						
3	Lack of communication between the parties						
4	Weather condition						
5	Regulatory changes						
6	Unforeseen ground condition						
	Others if, (to be listed and marked in						

	the same way						
F	**Effects of project delays**	**E.S. (5)**	**V.S. (4)**	**M.S. (3)**	**S.S. (2)**	**N.S. (1)**	**Additional Comment /Suggestion/ If any**
1	Time overrun						
2	Budget overrun						
3	Poor quality completed project						
4	Bad Public Relations						
5	Litigation						
6	Arbitration						
7	Disputes and claims						
8	Total abandonment						
	Others if, (to be listed and marked in the same way						

9. If you have suggestion concerning delay in road construction projects particularly, on roads construction projects in Oromia pertinent to Oromia Roads Authority road project, you are kindly requested to write here them, briefly.

APPENDIX:III Spearman's Rank Table

Sample size (n)	p = 0.05	p = 0.025	p = 0.01
4	1.0000	-	-
5	0.9000	1.0000	1.0000
6	0.2860	0.8857	0.9429
7	0.7143	0.7857	0.8929
8	0.6429	0.7381	0.8333
9	0.6000	0.7000	0.7833
10	0.5636	0.6485	0.7455
11	0.5364	0.6182	0.7091
12	0.5035	0.5874	0.6783
13	0.4825	0.5604	0.6484
14	0.4637	0.5385	0.6264
15	0.4464	0.5214	0.6036
16	0.4294	0.5029	0.5824
17	0.4142	0.4877	0.5662
18	0.4014	0.4716	0.5501
19	0.3912	0.4596	0.5351
20	0.3805	0.4466	0.5218
21	0.3701	0.4364	0.5091
22	0.3608	0.4252	0.4975
23	0.3528	0.4160	0.4862
24	0.3443	0.4070	0.4757
25	0.3369	0.3977	0.4662
26	0.3306	0.3901	0.4571
27	0.3242	0.3828	0.4487
28	0.3180	0.3755	0.4401
29	0.3118	0.3685	0.4325
30	0.3063	0.3624	0.4251
40	0.2640	0.3128	0.3681
50	0.2353	0.2791	0.3293
60	0.2144	0.2545	0.3005
70	0.1982	0.2354	0.2782
80	0.1852	0.2201	0.2602
90	0.1745	0.2074	0.2453
100	0.1654	0.1967	0.2327

APPENDIX:IV Road classification in Ethiopia

<table>
<tr><th colspan="5" rowspan="2">Classification</th><th colspan="4">Technical classification</th><th>Administrative classification</th></tr>
<tr><th>DS</th><th>Traffic (ADT)</th><th>Width (m)</th><th>Surface Type</th><th>Ownership</th></tr>
<tr><td rowspan="5"></td><td rowspan="5"></td><td rowspan="3"></td><td rowspan="2"></td><td rowspan="5">Trunk Roads</td><td>DS1</td><td>10,000-15,000</td><td>2 x 7.3</td><td rowspan="4">Asphalt Roads</td><td rowspan="4">ERA
(Federal Roads)</td></tr>
<tr><td>DS2</td><td>5,000-10,000</td><td>7.3</td></tr>
<tr><td rowspan="3">Main Access Roads</td><td rowspan="3">Link Roads</td><td>DS3</td><td>1,000-5,000</td><td>7</td></tr>
<tr><td rowspan="2">Collectors Roads</td><td>DS4</td><td>200-1,000</td><td>6.7</td></tr>
<tr><td>DS5</td><td>100-200</td><td>7.0</td><td rowspan="4">Gravel</td><td rowspan="3">RRAs
(Regional Roads) *</td></tr>
<tr><td rowspan="5">Feeder Roads</td><td rowspan="4"></td><td rowspan="4"></td><td rowspan="4"></td><td>DS6</td><td>50-100</td><td>6.0</td></tr>
<tr><td>DS7</td><td>30-75</td><td>4.0</td></tr>
<tr><td>DS8</td><td>25-50</td><td>4.0</td></tr>
<tr><td>DS9</td><td>0-25</td><td>4.0</td><td rowspan="2">Earth</td><td rowspan="2">Woreda Rural Road Office (Community Roads)</td></tr>
<tr><td>DS10</td><td>0-15</td><td>3.3</td></tr>
</table>

**** Area under investigation by the Researcher***

Source: Adopted from the Roads of Decentralization: The History of Rural Road Construction in Ethiopia 2012

Biography

Firdissa Yadeta Bayisa was born in East Wollega zone of Oromia Region, Ethiopia. Learnt elementary to High school in this zone. Firdissa awarded diploma in Statistics from Addis Ababa University in the year 2000. From the same institution, Addis Ababa University also awarded BA degree in Business Administration.

Firdissa joined Oromia Rural Roads Authority as soon as diploma was awarded, and was working for several times in the regional road as planner and monitoring and evaluation expert. After the regional road authority restructured, and became the regulatory body of the road construction, Firdissa worked as Budget administration and planning team leader of the regional road authority. Currently, beside to this Firdissa is working in Walabu Construction, Sh.Co. (GC-1) as Head, Finance and Procurement.